

In re Patent Application of  
PARSCHE  
Serial No. 10/695,046  
Filed: OCTOBER 28, 2003

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In the Claims:

This listing of claims replaces all prior versions and listing of claims in the application.

1. (Original) An antenna comprising:  
a substrate; and  
an electrically conductive circular ring on said substrate and having an outer diameter and an inner diameter concentrically arranged;  
the outer diameter being less than  $1/10$  an operating wavelength so that the antenna is electrically small relative to the wavelength;  
the inner diameter being in a range of  $\pi/6$  to  $\pi/2$  times the outer diameter.

2. (Original) The antenna according to Claim 1 wherein the outer diameter is about  $1/20^{\text{th}}$  of the wavelength.

3. (Original) The antenna according to Claim 1 wherein the inner diameter is  $\pi/4$  times the outer diameter.

4. (Original) The antenna according to Claim 1 wherein said electrically conductive circular ring has at least one gap therein.

5. (Original) The antenna according to Claim 1 wherein said electrically conductive circular ring has first and second circumferentially spaced gaps therein; wherein the first gap defines feed points for the antenna; and further comprising at least one tuning feature associated with the second gap.

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6. (Original) The antenna according to Claim 5 wherein the first and second gaps are diametrically opposed.

7. (Original) The antenna according to Claim 1 further comprising a magnetically coupled feed ring within the electrically conductive ring.

8. (Original) The antenna according to Claim 7 wherein the electrically conductive ring has a first gap therein; wherein the antenna further comprises at least one tuning feature associated with the first gap; and wherein said magnetically coupled feed ring has a second gap therein diametrically opposite the first gap to define feed points therefor.

9. (Original) The antenna according to Claim 8 further comprising an outer shield ring surrounding said electrically conductive ring and spaced therefrom.

10. (Original) The antenna according to Claim 9 wherein said shield ring has a third gap therein.

11. (Original) The antenna according to Claim 1 wherein said substrate comprises a dielectric material.

12. (Original) The antenna according to Claim 1 further comprising a feed structure to feed said electrically conductive circular ring.

13. (Original) The antenna according to Claim 12 wherein said feed structure comprises a printed feed line.

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14. (Original) The antenna according to Claim 12 where said feed structure comprises a coaxial feed line.

15. (Original) An antenna comprising:

a substrate; and

an electrically conductive circular ring on said substrate and having an outer diameter and an inner diameter concentrically arranged, said electrically conductive circular ring having at least one gap therein;

the outer diameter being less than  $1/10$  an operating wavelength so that the antenna is electrically small relative to the wavelength;

the inner diameter being  $\pi/4$  times the outer diameter.

16. (Original) The antenna according to Claim 15 wherein said electrically conductive circular ring has first and second circumferentially spaced gaps therein; wherein the first gap defines feed points for the antenna; and further comprising at least one tuning feature associated with the second gap.

17. (Original) The antenna according to Claim 16 wherein the first and second gaps are diametrically opposed.

18. (Original) The antenna according to Claim 15 further comprising a magnetically coupled feed ring within the electrically conductive circular ring.

19. (Original) The antenna according to Claim 18 wherein the at least one gap comprises a first gap; said

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antenna further comprises at least one tuning feature associated with the first gap; and wherein said magnetically coupled feed ring has a second gap therein diametrically opposite the first gap to define feed points therefor.

20. (Original) The antenna according to Claim 19 further comprising an outer shield ring surrounding said electrically conductive ring and spaced therefrom.

21. (Original) The antenna according to Claim 20 wherein said shield ring has a third gap therein.

22. (Original) The antenna according to Claim 15 wherein said substrate comprises a dielectric material.

23. (Original) The antenna according to Claim 15 further comprising a feed structure to feed said electrically conductive circular ring.

24. (Original) The antenna according to Claim 23 wherein said feed structure comprises a printed feed line.

25. (Original) The antenna according to Claim 23 where said feed structure comprises a coaxial feed line.

26. (Original) A method of making an antenna comprising:

forming an electrically conductive circular ring on a substrate including

forming an outer diameter of the electrically conductive circular ring to be less than 1/10 an

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operating wavelength so that the antenna is electrically small relative to the wavelength, and forming an inner diameter of the electrically conductive circular ring to be in a range of  $\pi/6$  to  $\pi/2$  times the outer diameter.

27. (Original) The method according to Claim 26 wherein the outer diameter is about  $1/20^{\text{th}}$  of  $\lambda$ .

28. (Original) The method according to Claim 26 wherein the inner diameter is  $\pi/4$  times the outer diameter.

29. (Original) The method according to Claim 26 further comprising forming at least one gap in the electrically conductive circular ring.

30. (Original) The method according to Claim 26 further comprising forming first and second circumferentially spaced gaps in the electrically conductive circular ring; wherein the first gap defines feed points for the antenna; and further comprising forming at least one tuning feature associated with the second gap.

31. (Original) The method according to Claim 30 wherein the first and second gaps are diametrically opposed.

32. (Original) The method according to Claim 26 further comprising forming a magnetically coupled feed ring within the electrically conductive ring.

33. (Original) The method according to Claim 32 wherein the electrically conductive ring has a first gap

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therein; wherein the antenna further comprises at least one tuning feature associated with the first gap; and wherein the magnetically coupled feed ring has a second gap therein diametrically opposite the first gap to define feed points therefor.

34. (Original) The method according to Claim 33 further comprising an outer shield ring surrounding the electrically conductive ring and spaced therefrom.

35. (Original) The method according to Claim 34 wherein the shield ring has a third gap therein.

36. (Original) The method according to Claim 26 wherein the substrate comprises a dielectric material.

37. (Original) The method according to Claim 26 further comprising providing a feed structure to feed the electrically conductive circular ring.

38. (Original) The method according to Claim 37 wherein the feed structure comprises a printed feed line.

39. (Original) The method according to Claim 37 wherein the feed structure comprises a coaxial feed line.

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